WHAT IS CLAIMED IS:

1. An apparatus for generating a preamble sequence in an orthogonal frequency division multiplexing (OFDM) communication system having A subcarriers in a frequency domain, the apparatus comprising:

a preamble sequence generator for generating a length-M×N preamble sequence, where M×N is less than A, by using a length-N Golay complementary sequence and a length-M Golay complementary sequence; and

an inverse fast Fourier transform (IFFT) processor for assigning elements constituting the preamble sequence to M×N subcarriers among the A subcarriers on a one-to-one mapping basis, assigning null data to the remaining subcarriers excluding the M×N subcarriers from the A subcarriers, and then IFFT-transforming the assigned result into time-domain data.

2. The apparatus of claim 1, wherein the preamble sequence generator comprises:

a Golay complementary sequence generator for generating a length-M×N Golay complementary sequence by combining the length-N Golay complementary sequence with the length-M Golay complementary sequence; and

a Golay complementary sequence/preamble sequence mapper for generating the preamble sequence so that the elements constituting the length-M×N Golay complementary sequence are mapped to the M×N subcarriers among the A subcarriers at a preset interval on a one-to-one basis.

3. The apparatus of claim 2, wherein the Golay complementary sequence generator comprises:

a first Golay complementary sequence pair generator for generating a length-N Golay complementary sequence pair;

a second Golay complementary sequence pair generator for generating a length-M Golay complementary sequence pair;

a Golay complementary sequence pair combiner for combining the length-N Golay complementary sequence pair with the length-M Golay complementary sequence pair according to a preset Golay complementary sequence pair combining rule, and outputting a length-M×N Golay complementary sequence pair;

a first Golay complementary sequence conjugate pair generator for generating a length-M×N Golay complementary sequence conjugate pair by selecting one of conjugate pairs of the length-M×N Golay complementary sequence pair; and

a selector for selecting, as a final length-M×N Golay complementary sequence, any one of the length-M×N Golay complementary sequence pair generated from the Golay complementary sequence pair combiner and the length-M×N Golay complementary sequence conjugate pair generated from the first Golay complementary sequence conjugate pair generator.

4. The apparatus of claim 3, wherein the first Golay complementary sequence pair generator comprises:

a selector for selecting one primitive Golay complementary sequence pair among length-N primitive Golay complementary sequence pairs; and

a second Golay complementary sequence conjugate pair generator for generating a length-N Golay complementary sequence conjugate pair by selecting one primitive Golay complementary sequence conjugate pair from conjugate pairs of the selected primitive Golay complementary sequence pair.

5. The apparatus of claim 3, wherein the second Golay complementary sequence pair generator comprises:

a selector for selecting one primitive Golay complementary sequence pair among length-M primitive Golay complementary sequence pairs; and

a second Golay complementary sequence conjugate pair generator for generating a length-M Golay complementary sequence conjugate pair by selecting one primitive Golay complementary sequence conjugate pair from conjugate pairs of the selected primitive Golay complementary sequence pair.

6. The apparatus of claim 3, wherein the Golay complementary sequence pair combiner generates the length-M×N Golay complementary sequence pair according to a parameter 'method' of a Golay complementary sequence pair combining rule as follows

method = 0

$$s_i = 0.5 \times \left[q_k(o_l + p_l) + r_{M-1-k}(o_l - p_l)\right]$$
$$u_i = 0.5 \times \left[r_k(o_l + p_l) - q_{M-1-k}(o_l - p_l)\right]$$

method = 1

$$s_i = 0.5 \times \left[q_{M-1-k}(o_l + p_l) + r_{M-1-k}(o_l - p_l)\right]$$
$$u_i = 0.5 \times \left[r_k(o_l + p_l) - q_k(o_l - p_l)\right]$$

method = 2

$$s_i = 0.5 \times \left[q_k(o_l + p_l) + r_k(o_l - p_l)\right]$$
$$u_i = 0.5 \times \left[r_{M-1-k}(o_l + p_l) - q_{M-1-k}(o_l - p_l)\right]$$

method = 3

$$s_i = 0.5 \times \left[q_{M-1-k}(o_l + p_l) + r_k(o_l - p_l)\right]$$
$$u_i = 0.5 \times \left[r_{M-1-k}(o_l + p_l) - q_k(o_l - p_l)\right]$$

method = 4

$$s_i = 0.5 \times \left[-q_k(o_l + p_l) + r_{M-1-k}(o_l - p_l)\right]$$
$$u_i = 0.5 \times \left[r_k(o_l + p_l) + q_{M-1-k}(o_l - p_l)\right]$$

method = 5

$$s_i = 0.5 \times \left[-q_{M-1-k}(o_l + p_l) + r_{M-1-k}(o_l - p_l)\right]$$
$$u_i = 0.5 \times \left[r_k(o_l + p_l) + q_k(o_l - p_l)\right]$$

method = 6

$$s_i = 0.5 \times \left[-q_k(o_l + p_l) + r_k(o_l - p_l)\right]$$
$$u_i = 0.5 \times \left[r_{M-1-k}(o_l + p_l) + q_{M-1-k}(o_l - p_l)\right]$$

method = 7

$$s_i = 0.5 \times \left[-q_{M-1-k}(o_l + b_l) + r_k(o_l - p_l)\right]$$
$$u_i = 0.5 \times \left[r_{M-1-k}(o_l + p_l) + q_k(o_l - p_l)\right]$$

method = 8

$$s_i = 0.5 \times \left[q_k(o_l + p_l) - r_{M-1-k}(o_l - p_l)\right]$$
$$u_i = 0.5 \times \left[-r_k(o_l + p_l) - q_{M-1-k}(o_l - p_l)\right]$$

method = 9

$$s_i = 0.5 \times \left[q_{M-1-k}(o_l + p_l) - r_{M-1-k}(o_l - p_l)\right]$$
$$u_i = 0.5 \times \left[-r_k(o_l + p_l) - q_k(o_l - p_l)\right]$$

method = 10

$$s_i = 0.5 \times \left[q_k(o_l + p_l) - r_k(o_l - p_l)\right]$$
$$u_i = 0.5 \times \left[-r_{M-1-k}(o_l + p_l) - q_{M-1-k}(o_l - p_l)\right]$$

method = 11

$$s_i = 0.5 \times \left[q_{M-1-k}(o_l + p_l) - r_k(o_l - p_l)\right]$$
$$u_i = 0.5 \times \left[-r_{M-1-k}(o_l + p_l) - q_k(o_l - p_l)\right]$$

method = 12

$$s_i = 0.5 \times \left[-q_k(o_l + p_l) - r_{M-1-k}(o_l - p_l)\right]$$
$$u_i = 0.5 \times \left[-r_k(o_l + p_l) + q_{M-1-k}(o_l - p_l)\right]$$

method = 13

$$s_i = 0.5 \times \left[-q_{M-1-k}(o_l + p_l) - r_{M-1-k}(o_l - p_l)\right]$$
$$u_i = 0.5 \times \left[-r_k(o_l + p_l) + q_k(o_l - p_l)\right]$$

method = 14

$$s_i = 0.5 \times \left[-q_k(o_l + p_l) - r_k(o_l - p_l)\right]$$
$$u_i = 0.5 \times \left[-r_{M-1-k}(o_l + p_l) + q_{M-1-k}(o_l - p_l)\right]$$

method = 15

$$s_i = 0.5 \times \left[-q_{M-1-k}(o_l + p_l) - r_k(o_l - p_l)\right]$$
$$u_i = 0.5 \times \left[-r_{M-1-k}(o_l + p_l) + q_k(o_l - p_l)\right]$$

where o_l and p_l represent elements constituting a length-N Golay complementary sequence pair [O,P], q_k and r_k represent elements constituting a length-M Golay complementary sequence pair [Q,R], and s_i and u_i represent elements constituting a length-M×N Golay complementary sequence pair [S,U], where i, l and k satisfy

$$0 \le i \le M \times N - 1, \quad l \equiv i (\bmod N), \quad k = \left\lfloor \frac{i}{N} \right\rfloor.$$

7. The apparatus of claim 2, wherein the Golay complementary sequence/preamble sequence mapper prevents elements having a value of +1 or -1 among the elements constituting the length-M×N Golay complementary

sequence from being mapped to a subcarrier having a time-domain direct current (DC) component among the M×N subcarriers.

8. The apparatus of claim 2, wherein the Golay complementary sequence/preamble sequence mapper enables elements having a value of +1 or -1 among the elements constituting the length M×N Golay complementary sequence to be mapped to odd subcarriers among the M×N subcarriers.

9. The apparatus of claim 2, wherein the Golay complementary sequence/preamble sequence mapper enables elements constituting the length M×N Golay complementary sequence to be mapped to the M×N subcarriers among the A subcarriers at a preset interval in accordance with

$$L(i) = \begin{cases} J(n), & i = GPM(n) \\ 0, & i \neq GPM(n) \end{cases}$$

where n in GPM(n) represents an index of elements constituting a Golay complementary sequence and GPM(n) represents an index of elements constituting a preamble sequence.

10. The apparatus of claim 8, wherein the GPM(n) is defined as

$$GPM(n) = -(B - E - nC)$$

where -B≤i≤B, 0≤n≤M×N-1, -B represents an initial subcarrier number of subcarriers excluding the subcarriers where the null data is inserted among the A subcarriers, and B represents a last subcarrier number.

11. The apparatus of claim 2, wherein the preset interval is defined as

B = Ck + D (for 0≤D≤C-1)

where C represents the preset interval, wherein if a parameter D=0, then E = 1, 2, ... , C-1 and F=C-E, and if D = 1, ... , C-1, then E=0, ... , C-1 ($D+E \neq F$) and F= (B-F) mod C = D + E (for $0 \leq F \leq C-1$).

12. The apparatus of claim 3, wherein the first Golay complementary sequence conjugate pair generator comprises:

a binary converter for receiving a select value for selecting one conjugate pair from conjugate pairs of the length-M×N Golay complementary sequence pair, and binary-converting the select value into a 6-digit binary number;

a Golay complementary sequence pair converter for receiving a length-M×N Golay complementary sequence pair $[T_0,T_0^C]$ output from the Golay complementary sequence pair combiner, receiving a value of a digit corresponding to 2^5 in the 6-digit binary number output from the binary converter, and one of outputting the length-M×N Golay complementary sequence pair $[T_0,T_0^C]$ as $[T_1,T_1^C]$ without conversion and converting order of the length-M×N Golay complementary sequence pair $[T_0,T_0^C]$ to output $[T_0^C,T_0]$ as $[T_1,T_1^C]$ according to the received digit value;

a first sequence's order converter for receiving a Golay complementary sequence pair $[T_1,T_1^C]$ output from the Golay complementary sequence pair converter, receiving a value of a digit corresponding to 2^4 in the 6-digit binary number output from the binary converter, and one of outputting the Golay complementary sequence pair $[T_1,T_1^C]$ as $[T_2,T_2^C]$ without order conversion and converting order of only a first sequence of the Golay complementary sequence pair $[T_1,T_1^C]$ to output $[T_2,T_2^C]$ according to the received digit value;

a second sequence's order converter for receiving a Golay complementary sequence pair $[T_2,T_2^C]$ output from the first sequence's order converter, receiving a value of a digit corresponding to 2^3 in the 6-digit binary number output from the binary converter, and one of outputting the Golay complementary sequence pair $[T_2,T_2^C]$ as $[T_3,T_3^C]$ without order conversion and

converting order of only a second sequence of the Golay complementary sequence pair $[T_2,T_2^C]$ to output $[T_3,T_3^C]$ according to the received digit value;

a first sequence's sign converter for receiving a Golay complementary sequence pair $[T_3,T_3^C]$ output from the second sequence's order converter, receiving a value of a digit corresponding to 2^2 in the 6-digit binary number output from the binary converter, and one of outputting the Golay complementary sequence pair $[T_3,T_3^C]$ as $[T_4,T_4^C]$ without sign conversion and converting a sign of only a first sequence of the Golay complementary sequence pair $[T_3,T_3^C]$ to output $[-T_3,T_3^C]$ as $[T_4,T_4^C]$ according to the received digit value;

a second sequence's sign converter for receiving a Golay complementary sequence pair $[T_4,T_4^C]$ output from the first sequence's sign converter, receiving a value of a digit corresponding to 2^1 in the 6-digit binary number output from the binary converter, and one of outputting the Golay complementary sequence pair $[T_4,T_4^C]$ as $[T_5,T_5^C]$ without sign conversion and converting a sign of only a second sequence of the Golay complementary sequence pair $[T_4,T_4^C]$ to output $[T_4,-T_4^C]$ as $[T_5,T_5^C]$ according to the received digit value; and

a Golay complementary sequence pair's odd sign converter for receiving a Golay complementary sequence pair $[T_5,T_5^C]$ output from the second sequence's sign converter, receiving a value of a digit corresponding to 2^0 in the 6-digit binary number output from the binary converter, and one of outputting the Golay complementary sequence pair $[T_5,T_5^C]$ as $[T_6,T_6^C]$ and converting a sign of odd elements of both sequences of the Golay complementary sequence pair $[T_5,T_5^C]$ to output $[T_6,T_6^C]$ according to the received digit value.

13. The apparatus of claim 1, wherein the preamble sequence generator generates a following preamble sequence Pg(-100:100) for A=256

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Pg(-100:100)= { 0,-1, 0,-1, 0,+1, 0,-1, 0,+1, 0,-1, 0,+1, 0,+1, 0,-1, 0,-1,
                0,+1, 0,+1, 0,-1, 0,+1, 0,-1, 0,+1, 0,-1, 0,-1, 0,+1, 0,+1,
                0,+1, 0,+1, 0,-1, 0,+1, 0,-1, 0,+1, 0,-1, 0,-1 ,0,+1, 0,+1,
                0,-1, 0,-1, 0,+1, 0,-1, 0,+1, 0,-1, 0,+1, 0,+1, 0,-1, 0,-1,
                0,-1, 0,-1, 0,+1, 0,+1, 0,+1,0,+1, 0,+1, 0,-1, 0,+1, 0,+1,
                0,-1,
                0,-1, 0,+1, 0,-1, 0,+1, 0,-1, 0,+1, 0,+1, 0,-1, 0,-1, 0,-1,
                0,-1, 0,+1, 0,+1, 0,+1, 0,+1, 0,+1, 0,-1, 0,+1, 0,+1, 0,-1,
                0,-1, 0,+1, 0,+1, 0,+1, 0,+1, 0,+1, 0,-1, 0,+1, 0,+1, 0,-1,
                0,-1, 0,+1, 0,+1, 0,+1, 0,+1, 0,+1, 0,-1, 0,+1, 0,+1, 0,+1,
                0,+1, 0,-1, 0,-1, 0,-1, 0,-1, 0,-1, 0,+1, 0,-1, 0,-1, 0}
                *sqrt(2)*sqrt(2)±1
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where "-n:n" represents subcarriers of -n^{th} to n^{th} subcarriers.

14. The apparatus of claim 1, wherein the preamble sequence generator generates the preamble sequence in which null data is inserted into a specific subcarrier corresponding to a DC component in the time domain among the M×N subcarriers.

15. A method for generating a preamble sequence in an orthogonal frequency division multiplexing (OFDM) communication system having A subcarriers in a frequency domain, the method comprising the steps of:

generating a length-M×N preamble sequence, where M×N is less than A , by using a length-N Golay complementary sequence and a length-M Golay complementary sequence; and

assigning elements constituting the preamble sequence to M×N subcarriers among the A subcarriers on a one-to-one mapping basis, assigning null data to the remaining subcarriers excluding the M×N subcarriers from the A subcarriers, and then IFFT-transforming the assigned result into time-domain data.

16. The method of claim 15, wherein the step of generating a preamble sequence comprises the steps of:

generating a length-M×N Golay complementary sequence by combining the length-N Golay complementary sequence with the length-M Golay complementary sequence; and

generating the preamble sequence enabling elements constituting the length-M×N Golay complementary sequence to be mapped to the M×N subcarriers among the A subcarriers at a preset interval on a one-to-one basis.

17. The method of claim 16, wherein the step of generating the length-M×N Golay complementary sequence comprises the steps of:

generating a length-N Golay complementary sequence pair;

generating a length-M Golay complementary sequence pair;

combining the length-N Golay complementary sequence pair with the length-M Golay complementary sequence pair according to a preset Golay complementary sequence pair combining rule, and outputting a length-M×N Golay complementary sequence pair;

generating a length-M×N Golay complementary sequence conjugate pair by selecting one of conjugate pairs of the length-M×N Golay complementary sequence pair; and

selecting any one of the length-M×N Golay complementary sequence pair and the length-M×N Golay complementary sequence conjugate pair, as a final length-M×N Golay complementary sequence.

18. The method of claim 17, wherein the step of generating the length-N Golay complementary sequence pair comprises the steps of:

selecting one primitive Golay complementary sequence pair among length-N primitive Golay complementary sequence pairs; and

generating a length-N Golay complementary sequence conjugate pair by selecting one primitive Golay complementary sequence conjugate pair from conjugate pairs of the selected primitive Golay complementary sequence pair.

19. The method of claim 17, wherein the step of generating the length-M Golay complementary sequence pair comprises the steps of:

selecting one primitive Golay complementary sequence pair among length-M primitive Golay complementary sequence pairs; and

generating a length-M Golay complementary sequence conjugate pair by selecting one primitive Golay complementary sequence conjugate pair from conjugate pairs of the selected primitive Golay complementary sequence pair.

20. The method of claim 17, wherein the step of generating the length-M×N Golay complementary sequence pair according to the Golay complementary sequence pair combining rule comprises the step of generating the length-M×N Golay complementary sequence pair according to a parameter 'method' of a following Golay complementary sequence pair combining rule

$$\begin{aligned}&\text{method}=0\\ &s_i=0.5\times\left[q_k(o_l+p_l)+r_{M-1-k}(o_l-p_l)\right]\\ &u_i=0.5\times\left[r_k(o_l+p_l)-q_{M-1-k}(o_l-p_l)\right]\end{aligned}$$

$$\begin{aligned}&\text{method}=1\\ &s_i=0.5\times\left[q_{M-1-k}(o_l+p_l)+r_{M-1-k}(o_l-p_l)\right]\\ &u_i=0.5\times\left[r_k(o_l+p_l)-q_k(o_l-p_l)\right]\end{aligned}$$

$$\begin{aligned}&\text{method}=2\\ &s_i=0.5\times\left[q_k(o_l+p_l)+r_k(o_l-p_l)\right]\\ &u_i=0.5\times\left[r_{M-1-k}(o_l+p_l)-q_{M-1-k}(o_l-p_l)\right]\end{aligned}$$

$$\begin{aligned}&\text{method}=3\\ &s_i=0.5\times\left[q_{M-1-k}(o_l+p_l)+r_k(o_l-p_l)\right]\\ &u_i=0.5\times\left[r_{M-1-k}(o_l+p_l)-q_k(o_l-p_l)\right]\end{aligned}$$

$$\begin{aligned}&\text{method}=4\\ &s_i=0.5\times\left[-q_k(o_l+p_l)+r_{M-1-k}(o_l-p_l)\right]\\ &u_i=0.5\times\left[r_k(o_l+p_l)+q_{M-1-k}(o_l-p_l)\right]\end{aligned}$$

$$\begin{aligned}&\text{method}=5\\ &s_i=0.5\times\left[-q_{M-1-k}(o_l+p_l)+r_{M-1-k}(o_l-p_l)\right]\\ &u_i=0.5\times\left[r_k(o_l+p_l)+q_k(o_l-p_l)\right]\end{aligned}$$

$$\begin{aligned}&\text{method}=6\\ &s_i=0.5\times\left[-q_k(o_l+p_l)+r_k(o_l-p_l)\right]\\ &u_i=0.5\times\left[r_{M-1-k}(o_l+p_l)+q_{M-1-k}(o_l-p_l)\right]\end{aligned}$$

$$\begin{aligned}&\text{method}=7\\ &s_i=0.5\times\left[-q_{M-1-k}(o_l+b_l)+r_k(o_l-p_l)\right]\\ &u_i=0.5\times\left[r_{M-1-k}(o_l+p_l)+q_k(o_l-p_l)\right]\end{aligned}$$

$$\begin{aligned}&\text{method}=8\\ &s_i=0.5\times\left[q_k(o_l+p_l)-r_{M-1-k}(o_l-p_l)\right]\\ &u_i=0.5\times\left[-r_k(o_l+p_l)-q_{M-1-k}(o_l-p_l)\right]\end{aligned}$$

$$\begin{aligned}&\text{method}=9\\ &s_i=0.5\times\left[q_{M-1-k}(o_l+p_l)-r_{M-1-k}(o_l-p_l)\right]\\ &u_i=0.5\times\left[-r_k(o_l+p_l)-q_k(o_l-p_l)\right]\end{aligned}$$

$$\begin{aligned}&\text{method}=10\\ &s_i=0.5\times\left[q_k(o_l+p_l)-r_k(o_l-p_l)\right]\\ &u_i=0.5\times\left[-r_{M-1-k}(o_l+p_l)-q_{M-1-k}(o_l-p_l)\right]\end{aligned}$$

$$\begin{aligned}&\text{method}=11\\ &s_i=0.5\times\left[q_{M-1-k}(o_l+p_l)-r_k(o_l-p_l)\right]\\ &u_i=0.5\times\left[-r_{M-1-k}(o_l+p_l)-q_k(o_l-p_l)\right]\end{aligned}$$

$$\begin{aligned}&\text{method}=12\\ &s_i=0.5\times\left[-q_k(o_l+p_l)-r_{M-1-k}(o_l-p_l)\right]\\ &u_i=0.5\times\left[-r_k(o_l+p_l)+q_{M-1-k}(o_l-p_l)\right]\end{aligned}$$

$$\begin{aligned}&\text{method}=13\\ &s_i=0.5\times\left[-q_{M-1-k}(o_l+p_l)-r_{M-1-k}(o_l-p_l)\right]\\ &u_i=0.5\times\left[-r_k(o_l+p_l)+q_k(o_l-p_l)\right]\end{aligned}$$

$$\begin{aligned}&\text{method}=14\\ &s_i=0.5\times\left[-q_k(o_l+p_l)-r_k(o_l-p_l)\right]\\ &u_i=0.5\times\left[-r_{M-1-k}(o_l+p_l)+q_{M-1-k}(o_l-p_l)\right]\end{aligned}$$

$$\begin{aligned}&\text{method}=15\\ &s_i=0.5\times\left[-q_{M-1-k}(o_l+p_l)-r_k(o_l-p_l)\right]\\ &u_i=0.5\times\left[-r_{M-1-k}(o_l+p_l)+q_k(o_l-p_l)\right]\end{aligned}$$

where o_l and p_l represent elements constituting a length-N Golay complementary sequence pair [O,P], q_k and r_k represent elements constituting a length-M Golay complementary sequence pair [Q,R], and s_i and u_i represent elements constituting a length-M×N Golay complementary sequence pair [S,U], where i, l and k satisfy

$$0 \le i \le M \times N - 1,\ \ l \equiv i (\bmod N),\ \ k = \left\lfloor \frac{i}{N} \right\rfloor.$$

21. The method of claim 16, wherein the step of mapping elements constituting the length-M×N Golay complementary sequence to the M×N subcarriers among the A subcarriers at the preset interval on the one-to-one basis comprises the step of preventing elements having a value of +1 or -1 among elements constituting the length-M×N Golay complementary sequence from being mapped to a subcarrier having a time-domain direct current (DC) component among the M×N subcarriers.

22. The method of claim 16, wherein the step of mapping elements constituting the length-M×N Golay complementary sequence to the M×N subcarriers among the A subcarriers at the preset interval on the one-to-one basis comprises the step of performing mapping elements having a value of +1 or -1 among elements constituting the length M×N Golay complementary sequence to odd subcarriers among the M×N subcarriers.

23. The method of claim 16, wherein the step of mapping elements constituting the length-M×N Golay complementary sequence to the M×N subcarriers among the A subcarriers at the preset interval on the one-to-one basis comprises the step of mapping elements constituting the length M×N Golay complementary sequence to the M×N subcarriers among the A subcarriers at a preset interval in accordance with

$$L(i)=\begin{cases}J(n), & i=GPM(n)\\ 0, & i\neq GPM(n)\end{cases}$$

where n in GPM(n) represents an index of elements constituting a Golay complementary sequence and GPM(n) represents an index of elements constituting a preamble sequence.

24. The method of claim 22, wherein the GPM(n) is defined as

$$GPM(n)=-(B-E-nC)$$

where $-B\leq i\leq B$, $0\leq n\leq M\times N-1$, -B represents an initial subcarrier number of subcarriers excluding the subcarriers where the null data is inserted among the A subcarriers, and B represents a last subcarrier number.

25. The method of claim 16, wherein the preset interval is defined as

$B = Ck + D$ (for $0\leq D\leq C-1$)

where C represents the preset interval, wherein if a parameter D=0, then E = 1, 2, ... , C-1 and F=C-E, and if D = 1, ... , C-1, then E=0, ... , C-1 ($D+E\neq F$) and F= (B-F) mod C = D + E (for $0\leq F\leq C-1$).

26. The method of claim 17, wherein the step of generating the Golay complementary sequence conjugate pair comprises the steps of:

(a) receiving a select value for selecting one conjugate pair from conjugate pairs of the length-M×N Golay complementary sequence pair, and binary-converting the select value into a 6-digit binary number;

(b) receiving a length-M×N Golay complementary sequence pair $[T_0,T_0^C]$ generated in the Golay complementary sequence pair combing step, receiving a value of a digit corresponding to 2^5 in the 6-digit binary number, and one of outputting the length-M×N Golay complementary sequence pair $[T_0,T_0^C]$ as $[T_1,T_1^C]$ without conversion and converting order of the length-M×N Golay

complementary sequence pair $[T_0,T_0^C]$ to output $[T_0^C,T_0]$ as $[T_1,T_1^C]$ according to the received digit value;

(c) receiving a Golay complementary sequence pair $[T_1,T_1^C]$ generated in the step (b), receiving a value of a digit corresponding to 2^4 in the 6-digit binary number, and one outputting the Golay complementary sequence pair $[T_1,T_1^C]$ as $[T_2,T_2^C]$ without order conversion and converting order of only a first sequence of the Golay complementary sequence pair $[T_1,T_1^C]$ to output $[T_2,T_2^C]$ according to the received digit value;

(d) receiving a Golay complementary sequence pair $[T_2,T_2^C]$ generated in the step (c), receiving a value of a digit corresponding to 2^3 in the 6-digit binary number, and one of outputting the Golay complementary sequence pair $[T_2,T_2^C]$ as $[T_3,T_3^C]$ without order conversion and converting order of only a second sequence of the Golay complementary sequence pair $[T_2,T_2^C]$ to output $[T_3,T_3^C]$ according to the received digit value;

(e) receiving a Golay complementary sequence pair $[T_3,T_3^C]$ generated in the step (d), receiving a value of a digit corresponding to 2^2 in the 6-digit binary number, and one of outputting the Golay complementary sequence pair $[T_3,T_3^C]$ as $[T_4,T_4^C]$ without sign conversion and converting a sign of only a first sequence of the Golay complementary sequence pair $[T_3,T_3^C]$ to output $[-T_3,T_3^C]$ as $[T_4,T_4^C]$ according to the received digit value;

(f) receiving a Golay complementary sequence pair $[T_4,T_4^C]$ generated in the step (e), receiving a value of a digit corresponding to 2^1 in the 6-digit binary number, and one of outputting the Golay complementary sequence pair $[T_4,T_4^C]$ as $[T_5,T_5^C]$ without sign conversion and converting a sign of only a second sequence of the Golay complementary sequence pair $[T_4,T_4^C]$ to output $[T_4,-T_4^C]$ as $[T_5,T_5^C]$ according to the received digit value; and

(g) receiving a Golay complementary sequence pair $[T_5,T_5^C]$ generated in the step (f), receiving a value of a digit corresponding to 2^0 in the 6-digit binary number, and one of outputting the Golay complementary sequence pair $[T_5,T_5^C]$ as $[T_6,T_6^C]$ and converting a sign of odd elements of both sequences of the Golay

complementary sequence pair $[T_5, T_5^C]$ to output $[T_6, T_6^C]$ according to the received digit value.

27. The method of claim 15, wherein for A=256, a preamble sequence Pg(-100:100) is generated of

```
Pg(-100:100)=  { 0,-1, 0,-1, 0,+1, 0,-1, 0,+1, 0,-1, 0,+1, 0,+1, 0,-1, 0,-1,
                 0,+1, 0,+1, 0,-1, 0,+1, 0,-1, 0,+1, 0,-1, 0,-1, 0,+1, 0,+1,
                 0,+1, 0,+1, 0,-1, 0,+1, 0,-1, 0,+1, 0,-1, 0,-1 ,0,+1, 0,+1,
                 0,-1, 0,-1, 0,+1, 0,-1, 0,+1, 0,-1, 0,+1, 0,+1, 0,-1, 0,-1,
                 0,-1, 0,-1, 0,+1, 0,+1, 0,+1,0,+1, 0,+1, 0,-1, 0,+1, 0,+1,
                 0,-1,
                 0,-1, 0,+1, 0,-1, 0,+1, 0,-1, 0,+1, 0,+1, 0,-1, 0,-1, 0,-1,
                 0,-1, 0,+1, 0,+1, 0,+1, 0,+1, 0,+1, 0,-1, 0,+1, 0,+1, 0,-1,
                 0,-1, 0,+1, 0,+1, 0,+1, 0,+1, 0,+1, 0,-1, 0,+1, 0,+1, 0,-1,
                 0,-1, 0,+1, 0,+1, 0,+1, 0,+1, 0,+1, 0,-1, 0,+1, 0,+1, 0,+1,
                 0,+1, 0,-1, 0,-1, 0,-1, 0,-1, 0,-1, 0,+1, 0,-1, 0,-1, 0}
                 *sqrt(2)*sqrt(2)±1
```

where "-n:n" represents subcarriers of $-n^{th}$ to n^{th} subcarriers.

28. The method of claim 15, wherein the step of generating the preamble sequence comprises the step inserting null data into a specific subcarrier corresponding to a DC component in the time domain among the M×N subcarriers.